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A PROSPECTIVE STUDY OF OSSICULOPLASTY RESULTS IN OPERATED CASES OF CHRONIC OTITIS MEDIA TUBOTYMPANIC TYPE

Otolaryngology

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ABSTRACT

Introduction: Ossiculoplasty is a surgical procedure to repair & reconstruct the middle ear ossicles. The goal of ossiculoplasty is to improve hearing. Successful ossiculoplasty depends on several factors. This prospective study was carried out to analyze hearing results of ossiculoplasty in such patients.

Material & Methods: Patients more than 18years of age, diagnosed with inactive tubotympanic chronic otitis media with conductive hearing loss who underwent ossiculoplasty were taken for study. Preoperative and post operative results and audiometry were analysed.

Results: 20 ossiculoplasty results were analysed. All ossiculoplasties were carried out in onestage surgery and patients were examined on follow up. 80% patients showed hearing improvement and 20% showed no improvement.

Conclusion: The majority of the ossiculoplasties had satisfactorily improved hearing status. Multivariate analysis should be performed to investigate prognostic factors of favourable long term hearing outcomes after ossiculoplasty. Better knowledge of these predictive factors may contribute to the surgeon's judgment and the information given to patients.

KEYWORDS

chronic otitis media , ossiculoplasty, graft, ossicle erosion, tympanoplasty

INTRODUCTION

Chronic suppurative otitis media is a chronic infection of the middle ear cleft, which is of two types , Mucosal-safe type and Squamous-unsafe type(1) . Tubotympanic type is a sequele of acute otitis media infection, leaving behind a permanent perforation caused by recurrent infections via Eustachian tube commonly from the tonsils or adenoids or post traumatic. It presentwith purely conductive type of hearing loss, rarely exceeding 40-45 db. (1) (CSOM) remains one of the most commonly prevalent disease in developing countries.(2,3) The infection is characterised by chronic inflammation of the middle ear and mastoid cavity, with tympanic membrane perforation. Chronic suppurative otitis media most often occurs in the first 6 years of life, and contributes to a significant disease burden worldwide, estimated at 65–330 million people, with 28 000 deaths per annum.(4)

Ossiculoplasty is the reconstruction of the ossicular chain. The earliest recorded ossiculoplasty was attempted by Matte in 1901 to re-establish a connection between the tympanic membrane and the oval window in the case of missing ossicles.Then, Wullstein in 1951 utilized a vinyl acrylic as an ossicular prosthesis. Since then, numerous materials including both biologic (autograft and homograft) and alloplastic have been used to re-create the middle ear sound-conducting mechanism.(5) This study was carried out to observe the results of ossiculoplasty in terms of hearing improvement and tympanic membrane graft uptake in operated cases of CSOM-tubotympanic type.

Aims of the study:

To study post operative results of ossiculoplasty in operated cases of inactive tubotympanic chronic otitis media with conductive hearing loss.

Objectives of study

To study the improvement in hearing loss by comparing pre and post operative cases by pure tone audiometry.

To study the results of graft uptake .

To co-relate failures by comparing preoperative and intraoperative factors.

Sample size:20

Study Design:Prospective interventional study

Sample collection: Patients attending the ENT OPD and undergoing ossiculoplasty for TUBOTYMPANIC CHRONIC OTITIS MEDIA at Dhiraj Hospital

Data collection: Data was collected on predesigned proforma for this study

Inclusion criteria:

- Patients of inactive tubotympanic chronic otitis media.
- Patients more than 18years of age
- Patients with conductive hearing loss
- Patients underwent mastoidectomy

Exclusion criteria:

- Patients not giving consent to be a part of the study
- Patients undergoing conservative treatment Patients less than18 years of age
- Patients having mixed or sensorineural hearing loss
- Patients of revision tympanoplasty

METHODOLOGY

Method Of Allocation: Patients more than 18years of age, diagnosed with inactive tubotympanic chronic otitis media with conductive hearing loss, who underwent ossiculoplasty were taken for stundy. Preoperative and post operative results including audiometry were analysed. Method of ossiculoplasty(type of ossicuclular graft material used): with 1)tragal cartilage 2)chonchal cartilage 3) bone -autologous incus when available. Audiometry Analysis: Average of Air-Bone gap at 500,1000,2000 & 4000 Hz was considered pre-operatively and compared with post operative result at similar criteria at 6 weeks and at 3 months. Follow-up: Noted at 6 weeks and at 3 months Duration of study- 6 months (february'2018-july'2018)

RESULTS

In this prospective study, a total of 20 cases of ossiculoplasty were studied in detail. Mean preoperative air conduction (AC) was 47.89 dB, mean bone conduction (BC) was 13.35 dB, and mean ABG was 34.54 dB. Most commonly erosion of long process of incus was noticed and incus were used in 14 patients for ossiculoplasty , followed by the stapes supra-structure in 4 patients. The malleus was the most resistant ossicle to the disease process ,though disease process was involved only in 2 cases it was found foreshorthened in 6 cases. The mean improvement(change) in post-operative AB-gap in 20 patients at

6 weeks was 15.76 dB and at 3 months was 21.49db.Type of ossicular involvement, severity of preoperative discharge before treatment, middle ear mucosal invovement (i.e. polypoidal or granulat ions),presence of handle of malleus without foreshortening ,eustachian tube patency were the factors found to be more significantly affect the result of ossiculoplasty along with minor factors like sclerosed mastoid cavity & type of osscicular reconstruction.

DISCUSSION

In the present study, the mean age of presentation was 34 years and 3 months, with the patients ranging from 18 to 62 years of age. There was a slight male predominance, with a male : female ratio of 1.10:1. Decreased hearing was the most common complaint among patients (100%), followed by ear discharge (97.5%) in this study. A minority of patients also complained of tinnitus (15.0%), earache (3.75%), and vertigo (5.0%). The right ear was involved in 12 patients, while the left ear was involved in 8 cases. In the present study, success was defined as an AB Gap less than15 dB on postoperative Day 90. Out of 20 cases, 16 patients had an ABG less than15 dB, accounting for an overall success rate of 80.0%. Five different surgeons operated on the patients and no statistically significant difference was found on success rates achieved according to operating surgeon (73.7–87.0%). The average change in AB Gap was 15.76 dB at 6 weeks & 21.49 dB at 3 M across 20 patients. In this study it was found that long process of incus is the part of the ossicular chain most commonly involved followed by the stapes suprastructure. The re-construction of ossicles were performed and results were compared on 90 days follow up .However long term follow up is required to consider bone resorption. This study is consistent with that of Yung et alwho found that the malleus handle was the only significant factor to determine the outcome of ossiculoplasty in the long run. (6) Dornhoffer et al, similarly found only the malleus manubrium to be significant, whereas the stapes suprastructure contributed little. Interestingly, he found that the presence of the stapes suprastructure was detrimental in cases involving more severe mucosal fibrosis. Poorer hearing results occurred in those cases where the stapes was present and the malleus was absent. This is consistent with the present study.(7) A clear trend for a worsening of outcome was observed as the severity of discharge increased, along with the condition of middle ear mucosa. These findings correlate well with those of Bellucci (2), who classified all cases into those with a good prognosis (Group 1; i.e. never infected), a fair prognosis (Group 2; i.e. intermittent discharge), a poor prognosis (Group 3; i.e. unremitting discharge), and a very poor prognosis (Group 4; i.e. cleft palate and nasopharyngeal deformities) according to the degree of otorrhea and Eustachian tube function. The ossicles which are not affected by the disease is an important prognostic factor in determining the functional outcome after surgery(8) The main factor in determining treatment success is ideal middle ear implant with the understanding that the middle ear environment in chronic ear disease, there was quest for conductive mechanism ever since Matte's first myringostapediopexy in 190.(9) Autografts is cost effective and hence preferred choice.(10) Restoring a columellar effect with ossiculoplasty for rehabilitation of hearing loss in case of ossicular chain discontinuity is one of the main objectives of tympanoplasty procedures, Many studies have shown that titanium prosthesis gave better anatomical and functional results than autologous materials(11) . Zollhner described the benefits of sculpturing the autologous incus in order to obtain a better assembly(12). Wehrs and others refined this technique and advocated the use of homograft ossicles.(13) Austin(14)(1972), Fisch (1994) and Penington(15) (1983) in their extended period of study reported good stability of hearing results with autografts. Black compared the results of malleus stapes assembly with malleus foot plate assembly and achieved the closure of air bone gap within 20dB in 86% of patients in the former and 80% in the later.(16) Al-Qudah M (2006) concluded that AB gap closure within 20dBHL was achieved in 77% of patients postoperatively with auto graft incus by malleus –stapes assembly.(17) Bauer (2000) analysed his 34 years of experience with autogenous incus and cortical bone to form a columella between stapes and tympanic membrane. In their study 85% showed an AB gap closure ≤ 20dB and 43% showed closure ≤ 10dB when TM was normal.(18) Naragund Al (2011) concluded that results after ossiculoplasty with autologous incus were significantly better compared with those after other prostheses. (19) Kartush (1999) found that the results of incus remnant and cortical bone were similar. They also found that the autogenous bone provides better sound transmission than cartilage.(20)

Summary

The incus was the most susceptible ossicle to the disease, whereas the malleus was the most resistant ossicle. Patent Eustachian tube, normal middle ear mucosa, dry ear and presence of the handle of malleus indicates a favourable outcome of ossiculoplasty. Autograft incus fared better when the malleus handle was present, while other (cartilage) grafts may be used for better results when the malleus handle was eroded. With the continuing advances in our understanding of middle ear mechanics, the outcomes of ossiculoplasty are improving. By paying careful attention to the principles of ossicular reconstruction and the lessons learned from basic science as translated to clinical practice, surgeons are increasingly able to optimize hearing results for their patients.

CONCLUSION

Success in ossiculoplasty is determined by technical ability and, to a large extent, case selection. Likewise, much of the variability in the literature concerning hearing results after ossiculoplasty is due to a lack of understanding and uniform reporting of those middle ear factors that influence the results. Importance of a middle ear grading system that is reliable and simple to use cannot be overemphasized. Valid attempts have been made to elucidate prognostic factors in ossiculoplasty, each contributing significantly to our understanding of middle ear disease and its effect on hearing results with ossiculoplasty.

Table 1: Comparision between different graft material used with hearing improvment

		Material of	for ossicular	ossiculoplasty(type graft material used)	
		Tragal cartilage	Chonchal cartilage	Autologus incus	Total
Results (post-operative)	Hearing improvement present	9	1	6	16
	Hearing improvement abesent	3	0	1	4

Table 1:This table represents that use of autologus incus has more success rates compared to use of tragal cartilage during ossiculoplasty

Table 2: Comparision between severity of discharge with hearing improvement

		Results (post-operative)		
		Hearing improvement present	Hearing improvement absent	
Severity of ear discharge(pre-operative before treatment)	No discharge	1	-	1
	Minimal*	4	-	4
	Intermittent**	9	2	11
	Profuse***	3	2	5

*Discharge accumulating in EAC but not soiling linen at night;
**Discharge soiling linen at night;
*** Discharge reappearing immediately after cleaning the ear
Table 2: This table show's that as the severity of pre-operative discharge increases, the prognosis of ossiculoplasty decreases in terms of hearing improvement.

Table 3: Comparision between ossicular structure involved in disease process with hearing improvement

	Ossicular involvement (intra operative findings)		
	Malleus handle erosion	Long process of incus necrosed	Stapes supra structure absent
Post operative hearing improvement present	0	13	3
Post operative hearing improvement absent	2	1	1
total	2	14	4

Table 3: The long process of incus, associated with 14 patients, was the

part of the ossicular chain most commonly involved, followed by the stapes suprastructure in 4 patients. The malleus was the most resistant ossicle to the disease process, involved in 2 patients.

Table 4: Comparision between middle ear pathology with hearing improvement

			Results(post-operative)		
			Hearing improvement present	Hearing improvement absent	Total
Middle ear pathology & intra op. finding	Middle ear mucosa	Diseased (polypoidal or granulations)	5	3	8
		Normal	11	1	12
	mastoid cavity	Sclerosed	4	1	5
		Pneumatic	12	3	15
	Eustachian tube	Blocked	2	3	5
		Patent	14	1	15

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